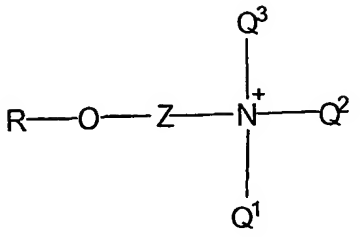
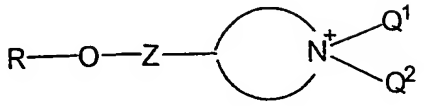
What is Claimed:

1. A compound according to formula (I) or (II)



(I)



(II)

wherein for both formula (I) and formula (II)

R is (i) an amino acid or amino acid derivative having antioxidant activity, or (ii) a peptide comprising two or more amino acids or amino acid derivatives, wherein the peptide has antioxidant activity;

Z is a linker molecule containing 1 to about 20 atoms in a direct chain; and

Q^1, Q^2, and Q^3 are independently aliphatic C1 to C5 hydrocarbons, or Q^2 and Q^3 together form an aliphatic N-heterocycle;

wherein for formula (II), the N-heterocycle possesses a quaternary nitrogen and Q^2 is optional.

2. The compound according to claim 1 wherein R is an amino acid or amino acid derivative having antioxidant activity.

3. The compound according to claim 2 wherein the amino acid or amino acid derivative is an L-amino acid or amino acid derivative.

4. The compound according to claim 2 wherein the amino acid or amino acid derivative is an D-amino acid or amino acid derivative.

5. The compound according to claim 2 wherein R is selected from the group consisting of glutamic acid, cysteine, N-acetyl-cysteine, glycine, and 2,2-dialkylthiazolidine-4-carboxylic acid.

6. The compound according to claim 1 wherein R is a peptide comprising from two up to ten amino acids or amino acid derivatives.

7. The compound according to claim 6 wherein R is a peptide comprising from two up to five amino acids or amino acid derivatives.

8. The compound according to claim 6 wherein the peptide comprises at least one D-amino acid or amino acid derivative.

9. The compound according to claim 6 wherein the peptide comprises only L-amino acids or amino acid derivatives.

10. The compound according to claim 6 wherein R is selected from the group consisting of L-γ-glutamylcysteine, L-γ-glutamylglycine, L-cysteinylglycine, glutathione, L-carnosine, L-carnitine, and acetyl-L-carnitine.

11. The compound according to claim 1 wherein the compound is selected from the group consisting of:

L-γ-glutamyl-L-cysteinylglycine choline ester;

D-γ-glutamyl-L-cysteinylglycine choline ester;

L-cysteine choline ester;

L-γ-glutamyl-L-cysteine choline ester;

D-γ-glutamyl-L-cysteine choline ester;

N-acetyl-L-cysteine choline ester;

D-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid; and

L-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid.

12. The compound according to claim 1 wherein the compound is in the form of a pharmaceutically acceptable salt.

13. The compound according to claim 1 wherein Z comprises

$—Z^1—Z^2—$,

$—Z^1—O—Z^2—$,

$—Z^1—S—Z^2—$,

$—Z^1—N(H)—Z^2—$,

$—Z^1—CO—N(H)—Z^2—$, or

$—Z^1—N(H)—CO—Z^2—$,

where

Z^1 is a direct link, an aliphatic or non-aliphatic C1 to C10 hydrocarbon, a single, fused or multi-ring aromatic, or an aliphatic or non-aromatic cyclic group; and

Z^2 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon, a single, fused or multi-ring aromatic, or an aliphatic or non-aromatic cyclic group.

14. The compound according to claim 13 wherein Z^1 is a direct link and Z^2 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon.

15. The compound according to claim 13 wherein Z^1 is a direct link and Z^2 is a single, fused or multi-ring aromatic.

16. The compound according to claim 13 wherein Z^1 is a direct link and Z^2 is an aliphatic or non-aromatic cyclic group.

17. The compound according to claim 13 wherein Z^1 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon and Z^2 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon.

18. The compound according to claim 13 wherein Z^1 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon and Z^2 is a single, fused or multi-ring aromatic.

19. The compound according to claim 13 wherein Z^1 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon and Z^2 is an aliphatic or non-aromatic cyclic group.

20. The compound according to claim 13 wherein Z^1 is a single, fused or multi-ring aromatic and Z^2 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon.

21. The compound according to claim 13 wherein Z^1 is a single, fused or multi-ring aromatic and Z^2 is a single, fused or multi-ring aromatic.

22. The compound according to claim 13 wherein Z^1 is a single, fused or multi-ring aromatic and Z^2 is an aliphatic or non-aromatic cyclic group.

23. The compound according to claim 13 wherein Z^1 is an aliphatic or non-aromatic cyclic group and Z^2 is an aliphatic or non-aliphatic C1 to C10 hydrocarbon.

24. The compound according to claim 13 wherein Z^1 is an aliphatic or non-aromatic cyclic group and Z^2 is a single, fused or multi-ring aromatic.

25. The compound according to claim 13 wherein Z^1 is an aliphatic or non-aromatic cyclic group and Z^2 is an aliphatic or non-aliphatic cyclic group.

26. The compound according to claim 1 having a structure according to formula (I).

27. The compound according to claim 26 wherein Q^1, Q^2, and Q^3 are independently aliphatic C1 to C5 hydrocarbons.

28. The compound according to claim 26 wherein Q^2 and Q^3 together form an aliphatic N-heterocycle.

29. The compound according to claim 1 having a structure according to formula (II).

30. The compound according to claim 29 wherein Q^2 is not present, the N-heterocyclic amine comprising a quaternary nitrogen selected from the group consisting of pyridinyl, pyrimidinyl, quinolinyl, isoquinolinyl, imidazolyl, pyrazolyl, and pirazinyl.

31. The compound according to claim 29 wherein Q^2 is present, the N-heterocyclic amine comprising a quaternary nitrogen selected from the group consisting of pyrrolyl, pyrrolidinyl, morpholinyl, and piperidinyl.

32. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and the compound according to claim 1.

33. A method of inhibiting oxidative stress-induced cell injury and/or death comprising:

providing a compound according to claim 1 and

contacting a cell with the compound, whereby the compound is taken up by the cell and enters mitochondria of the cell, thereby scavenging oxidative free radicals and/or reactive oxygen species to inhibit oxidative stress-induced cell injury and/or death.

34. The method according to claim 33 wherein the cell is *ex vivo*.

35. The method according to claim 33 wherein the cell is *in vivo*.

36. The method according to claim 33 wherein the compound is selected from the group consisting of:

L-γ-glutamyl-L-cysteinylglycine choline ester;

D-γ-glutamyl-L-cysteinylglycine choline ester;

L-cysteine choline ester;

L-γ-glutamyl-L-cysteine choline ester;

D-γ-glutamyl-L-cysteine choline ester;

N-acetyl-L-cysteine choline ester;

D-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid; and

L-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid.

37. The method according to claim 33 wherein the compound is in the form of a pharmaceutical composition.

38. The method according to claim 33 wherein the cell is a neuronal cell, muscle cell, liver cell, or kidney cell.

39. A method of treating a condition associated with oxidative stress-induced cell injury and/or death comprising:

providing a compound according to claim 1 and

administering the compound to a patient having a condition associated with oxidative stress-induced cell injury and/or death, whereby the compound is taken up by cells at risk of oxidative stress-induced injury and/or death,

and enters mitochondria of the cells to inhibit oxidative stress-induced injury and/or death thereof, thereby treating the condition.

40. The method according to claim 39 wherein the condition associated with oxidative stress-induced cell injury and/or death is selected from the group consisting of stroke, neurodegenerative disease, trauma, muscular disorders, diabetes, ischemia-reperfusion tissue injury, hypoxic-induced tissue damage, migraines, congenital mitochondrial diseases, neuromuscular degenerative disorders, epilepsy, neuropathy, neurological and neuropsychological developmental delays, amyotrophic lateral sclerosis, renal tubular acidosis, and aging related diseases or disorders.

41. The method according to claim 39 wherein said administering is carried out orally, parenterally, subcutaneously, intravenously, intramuscularly, intraperitoneally, by intranasal instillation, by implantation, by intracavitary or intravesical instillation, intraocularly, intraarterially, intralesionally, transdermally, transmucosally or via inhalation.

42. The method according to claim 39 wherein said administering is repeated.

43. The method according to claim 39 wherein the compound is selected from the group consisting of:

L-γ-glutamyl-L-cysteinylglycine choline ester;

L-cysteine choline ester;

L-γ-glutamyl-L-cysteine choline ester;

D-γ-glutamyl-L-cysteine choline ester;

N-acetyl-L-cysteine choline ester;

D-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid; and

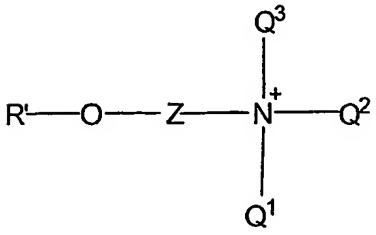
L-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid.

44. The method according to claim 39 wherein the compound is in the form of a pharmaceutical composition.

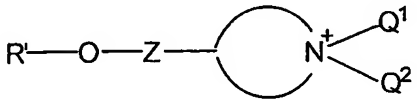
45. The method according to claim 39 wherein the cell is a neuronal cell, muscle cell, liver cell, or kidney cell.

46. A method of making a compound of formula (I) or formula (II) according to claim 1, the method comprising:

reacting an intermediate according to formula (III) or formula (IV)



(III)



(IV)

wherein R′ is a derivative of R having one or more protecting groups, with one or more agents that are effective to remove the one or more protecting groups, thereby forming the compound of formula (I) or the compound of formula (II), respectively.

47. The method according to claim 46 wherein said reacting comprises:

exposing the intermediate according to formula (III) or formula (IV) to trifluoroacetic acid under conditions effective to remove the one or more protecting groups; and

exposing the deprotected intermediate according to formula (III) or formula (IV) to a cation scavenger agent to form the compound of formula (I) or formula (II), respectively.

48. The method according to claim 47 wherein the cation scavenger agent is triethyl silane.

49. The method according to claim 46 further comprising:

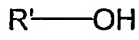
reacting an intermediate according to formula (V)

(V)

with Q^1—$N(Q^2)$—Q^3 under conditions effective to form the intermediate according to formula (III).

50. The method according to claim 49 further comprising:

reacting an intermediate according to formula (VI)

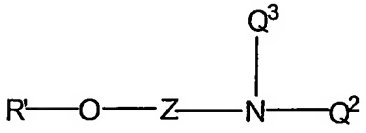


(VI)

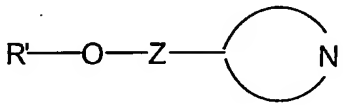
with HO—Z—Br under conditions effective to form the intermediate according to formula (V).

51. The method according to claim 46 further comprising:

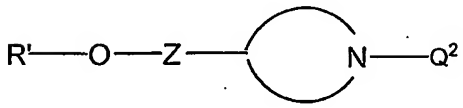
reacting an intermediate according to formula (VII), formula (VIIIa), or formula (VIIIb)



(VII)



(VIIIa)



(VIIIb)

with I—Q^1 under conditions effective to form the intermediate according to formula (III) or formula (IV), respectively.

52. The method according to claim 51 further comprising:

reacting an intermediate R′—OH with HO—Z—$N(Q^2)$—Q^3 or HO—Z—(N-heterocyclic amine) or HO—Z—(N-heterocyclic amine)—Q^2 under conditions effective to form the intermediate according to formula (VII) or formula (VIIIa) or formula (VIIIb), respectively.

53. The method according to claim 46 wherein R' is a protected glutathione, the method further comprising:

reacting N-trimethyl-alkyl glycine ester with protected L-γ-glutamyl-L-cysteine under conditions effective to form the intermediate according to formula (III).

54. The method according to claim 46 wherein R is L-cysteine, the method further comprising:

treating the compound according to formula (I) where R is L-cysteine with acetone under conditions effective to form (R)-2-(trimethylamino)ethyl-2,2-dimethylthiazolidine-4-carboxylic acid.